

考試科目	財務管理	所別	財管所	考試時間	2月27日(星期日)第1節
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1. 單選題 (總分: 30%, 每題: 3%)

1. An agency problem can be alleviated by:
 - a. requiring all organizations to be sole proprietorships.
 - b. compensating managers in such a way that acting in the best interest of shareholders is also in the best interest of managers.
 - c. asking managers to take on more risk than they are comfortable taking.
 - d. a and b.

2. Company A is considering the following new project in the electronic industry. Initial investment in plant and equipment \$9.706 million required today. Revenues from sales starting one year from now \$8.407 million per year. Costs starting one year from now \$3.588 million per year. If the project will last 5 years, what is its NPV? Assume the appropriate discount rate is 10%, and the tax rate is 32.0%. The plant and equipment is depreciated using straight-line method and has no salvage value at end of the project. No working capital is employed.
 - a. \$4.632 million
 - b. \$6.691 million
 - c. \$5.071 million
 - d. \$3.603 million

3. Pet-mart is an all-equity firm with a current cost of capital of 16%. The risk-free rate is 6%, and the market risk premium is 10%. Pet-mart is considering a new project that has 50% more beta risk than the firm's present beta risk. The IRR on the new project is 20%. Should the project be accepted?
 - a. Yes, the IRR is higher than the firm's cost of capital.
 - b. Yes, the IRR is higher than the project's cost of capital.
 - c. No, the IRR is lower than the firm's cost of capital.
 - d. No, the IRR is lower than the project's cost of capital.

4. First Local Bank is advertising an APR on its loans of 15% compounded quarterly. Last National Bank is advertising an APR of 14% compounded continuously. Which bank is advertising the lower effective annual interest rate?
 - a. First Local. The EAR is 16.06%.
 - b. First Local. The EAR is 15.87%.
 - c. Last National. The EAR is 15.03%.
 - d. Last National. The EAR is 16.56%.

5. Which of the following statements is false?
 - a. Modigliani and Miller's conclusion verified the common view, which stated that even with perfect capital markets, leverage would affect a firm's value.
 - b. We can evaluate the relationship between risk and return more formally by computing the sensitivity of each security's return to the systematic risk of the economy.
 - c. Investors in levered equity require a higher expected return to compensate for its increased risk.
 - d. Leverage increases the risk of equity even when there is no risk that the firm will default.

6. Which of the following statements is false?
 - a. Because very little trading is required to maintain it, an equal-weighted portfolio is called a passive portfolio.
 - b. If the number of shares in a value weighted portfolio does not change, but only the prices change, the portfolio will remain value weighted.
 - c. The CAPM says that individual investors should hold the market portfolio, a value-weighted portfolio of all risky securities in the market.
 - d. A price weighted portfolio holds an equal number of shares of each stock, independent of their size.

請注意：背面還有試題。

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7. You are thinking about investing in a mine that will produce \$100,000 worth of coal in the first year. As the coal closest to the surface is removed it will become more difficult to extract the coal. Therefore, the value of the coal that you mine will decline at a rate of 6% per year forever. If the appropriate interest rate is 8%, then the value of this mining operation is closest to:
- \$714,286
 - \$5,000,000
 - \$1,666,667
 - This problem cannot be solved.
8. Which of the following statements is false?
- It is possible that an IRR does not exist for an investment opportunity.
 - If the payback period is less than a pre-specified length of time you accept the project.
 - In general, the IRR rule works for a stand-alone project if all of the project's positive cash flows precede its negative cash flows.
 - It is possible that there is no discount rate that will set the NPV equal to zero.
9. An individual shareholder feels that management is engaged in activities that are not value maximizing strategies. What response to this conflict of interest is likely to be the optimal action for the shareholder to take?
- Attend the annual meeting and cast her votes against management
 - Submit a proposal to be voted on at the meeting
 - Start a proxy fight to remove the management
 - Sell her stock
10. The CAPM does not require investors have homogeneous expectations, but rather that they have
- limited rationality.
 - limited biases.
 - heterogenous expectations.
 - rational expectations.



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II. 簡答及計算題 (總分: 70%)

1. A 15-year security has a price of \$340.4689. The security pays \$50 at the end of each of the next 5 years, and then it pays a different fixed cash flow amount at the end of each of the following 10 years. Interest rates are 9 percent. What is the annual cash flow amount between Years 6 and 15? (10%)
2. Define and briefly explain the following terms: (20%, 4% each)
 - a. Agency cost.
 - b. Duration.
 - c. Efficient market paradox.
 - d. Size effect.
 - e. Disposition effect.
3. Two years ago the Morton's Restaurant purchased an oven for \$60,000. The owner, Steven Morton, has learned that a new oven is available that will cook twice as fast as the existing oven. This new oven can be purchased for \$100,000 and would be depreciated straight line over 8 years, after which it would have no salvage value. Steven Morton expects that the new oven will produce EBITDA of \$50,000 per year for the next eight years while the existing oven produces EBITDA of only \$35,000 per year. The current oven is being depreciated straight line over its useful life of 10 years after which it will have no salvage value. All other operating expenses are identical for both ovens. The existing oven can be sold to another restaurant now for \$40,000. The Morton's tax rate is 35%.
 - a. How much is the incremental cash flow that the Morton's will incur today (Year 0) if they elect to upgrade to the new oven? (5%)
 - b. How much is the incremental cash flow that the Morton's will incur in year 1 if they elect to upgrade to the new oven? (5%)
 - c. If the Morton's opportunity cost of capital is 10%, then what is the NPV for upgrading to the new oven? What decision should the Morton's take regarding the new oven? (10%)
4. Firm A has promised payments to its bondholders that total \$100. The company believes that there is an 80% chance that the cash flow will be sufficient to meet these claims. However, there is a 20% chance that cash flows will fall short, in which case total earnings are expected to be \$70. If the bonds sell in the market for \$80, what is an estimate of the bankruptcy costs for firm A and their impact on the bond price? Assume a cost of debt of 10%. (10%)
5. Why equity can be viewed as a call option on the firm's assets? When would a shareholder allow the call to expire? (10%)

請注意：背面還有試題。

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APPENDIX A

APPENDIX TABLE 1

Discount factors: Present value of \$1 to be received after t years = $1/(1+r)^t$.

Number of Years	Interest Rate per Year														
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%
1	.990	.980	.971	.962	.952	.943	.935	.926	.917	.909	.901	.893	.885	.877	.870
2	.980	.961	.943	.925	.907	.890	.873	.857	.842	.826	.812	.797	.783	.769	.756
3	.971	.942	.915	.889	.864	.840	.816	.794	.772	.751	.731	.712	.693	.675	.658
4	.961	.924	.888	.855	.823	.792	.763	.735	.708	.683	.659	.636	.613	.592	.572
5	.951	.906	.863	.822	.784	.747	.713	.681	.650	.621	.593	.567	.543	.519	.497
6	.942	.888	.837	.790	.746	.705	.666	.630	.596	.564	.535	.507	.480	.456	.432
7	.933	.871	.813	.760	.711	.665	.623	.583	.547	.513	.482	.452	.425	.400	.376
8	.923	.853	.789	.731	.677	.627	.582	.540	.502	.467	.434	.404	.376	.351	.327
9	.914	.837	.766	.703	.645	.592	.544	.500	.460	.424	.391	.361	.333	.308	.284
10	.905	.820	.744	.676	.614	.558	.508	.463	.422	.386	.352	.322	.295	.270	.247
11	.896	.804	.722	.650	.585	.527	.475	.429	.388	.350	.317	.287	.261	.237	.215
12	.887	.788	.701	.625	.557	.497	.444	.397	.356	.319	.286	.257	.231	.208	.187
13	.879	.773	.681	.601	.530	.469	.415	.368	.326	.290	.258	.229	.204	.182	.163
14	.870	.758	.661	.577	.505	.442	.388	.340	.299	.263	.232	.205	.181	.160	.141
15	.861	.743	.642	.555	.481	.417	.362	.315	.275	.239	.209	.183	.160	.140	.123
16	.853	.728	.623	.534	.458	.394	.339	.292	.252	.218	.188	.163	.141	.123	.107
17	.844	.714	.605	.513	.436	.371	.317	.270	.231	.198	.170	.146	.125	.108	.093
18	.836	.700	.587	.494	.416	.350	.296	.250	.212	.180	.153	.130	.111	.095	.081
19	.828	.686	.570	.475	.396	.331	.277	.232	.194	.164	.138	.116	.098	.083	.070
20	.820	.673	.554	.456	.377	.312	.258	.215	.178	.149	.124	.104	.087	.073	.061

Number of Years	Interest Rate per Year														
	16%	17%	18%	19%	20%	21%	22%	23%	24%	25%	26%	27%	28%	29%	30%
1	.862	.855	.847	.840	.833	.826	.820	.813	.806	.800	.794	.787	.781	.775	.769
2	.743	.731	.718	.706	.694	.683	.672	.661	.650	.640	.630	.620	.610	.601	.592
3	.641	.624	.609	.593	.579	.564	.551	.537	.524	.512	.500	.488	.477	.466	.455
4	.552	.534	.516	.499	.482	.467	.451	.437	.423	.410	.397	.384	.373	.361	.350
5	.476	.456	.437	.419	.402	.386	.370	.355	.341	.328	.315	.303	.291	.280	.269
6	.410	.390	.370	.352	.335	.319	.303	.289	.275	.262	.250	.238	.227	.217	.207
7	.354	.333	.314	.296	.279	.263	.249	.235	.222	.210	.198	.188	.178	.168	.159
8	.305	.285	.266	.249	.233	.218	.204	.191	.179	.168	.157	.148	.139	.130	.123
9	.263	.243	.225	.209	.194	.180	.167	.155	.144	.134	.125	.116	.108	.101	.094
10	.227	.208	.191	.176	.162	.149	.137	.126	.116	.107	.099	.092	.085	.078	.073
11	.195	.178	.162	.148	.135	.123	.112	.103	.094	.086	.079	.072	.066	.061	.056
12	.168	.152	.137	.124	.112	.102	.092	.083	.076	.069	.062	.057	.052	.047	.043
13	.145	.130	.116	.104	.093	.084	.075	.068	.061	.055	.050	.045	.040	.037	.033
14	.125	.111	.099	.088	.078	.069	.062	.055	.049	.044	.039	.035	.032	.028	.025
15	.108	.095	.084	.074	.065	.057	.051	.045	.040	.035	.031	.028	.025	.022	.020
16	.093	.081	.071	.062	.054	.047	.042	.036	.032	.028	.025	.022	.019	.017	.015
17	.080	.069	.060	.052	.045	.039	.034	.030	.026	.023	.020	.017	.015	.013	.012
18	.069	.059	.051	.044	.038	.032	.028	.024	.021	.018	.016	.014	.012	.010	.009
19	.060	.051	.043	.037	.031	.027	.023	.020	.017	.014	.012	.011	.009	.008	.007
20	.051	.043	.037	.031	.026	.022	.019	.016	.014	.012	.010	.008	.007	.006	.005

Note: For example, if the interest rate is 10% per year, the present value of \$1 received at year 5 is \$.621.

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APPENDIX TABLE 3

Annuity table: Present value of \$1 per year for each of t years = $1/r - 1/[r(1 + r)^t]$.

Number of Years	Interest Rate per Year														
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%
1	.990	.980	.971	.962	.952	.943	.935	.926	.917	.909	.901	.893	.885	.877	.870
2	1.970	1.942	1.913	1.886	1.859	1.833	1.808	1.783	1.759	1.736	1.713	1.690	1.668	1.647	1.626
3	2.941	2.884	2.829	2.775	2.723	2.673	2.624	2.577	2.531	2.487	2.444	2.402	2.361	2.322	2.283
4	3.902	3.808	3.717	3.630	3.546	3.465	3.387	3.312	3.240	3.170	3.102	3.037	2.974	2.914	2.855
5	4.853	4.713	4.580	4.452	4.329	4.212	4.100	3.993	3.890	3.791	3.696	3.605	3.517	3.433	3.352
6	5.795	5.601	5.417	5.242	5.076	4.917	4.767	4.623	4.486	4.355	4.231	4.111	3.998	3.889	3.784
7	6.728	6.472	6.230	6.002	5.786	5.582	5.389	5.206	5.033	4.868	4.712	4.564	4.423	4.288	4.160
8	7.652	7.325	7.020	6.733	6.463	6.210	5.971	5.747	5.535	5.335	5.146	4.968	4.799	4.639	4.487
9	8.566	8.162	7.786	7.435	7.108	6.802	6.515	6.247	5.995	5.759	5.537	5.328	5.132	4.946	4.772
10	9.471	8.983	8.530	8.111	7.722	7.360	7.024	6.710	6.418	6.145	5.889	5.650	5.426	5.216	5.019
11	10.37	9.787	9.253	8.760	8.306	7.887	7.499	7.139	6.805	6.495	6.207	5.938	5.687	5.453	5.234
12	11.26	10.58	9.954	9.385	8.863	8.384	7.943	7.536	7.161	6.814	6.492	6.194	5.918	5.660	5.421
13	12.13	11.35	10.63	9.986	9.394	8.853	8.358	7.904	7.487	7.103	6.750	6.424	6.122	5.842	5.583
14	13.00	12.11	11.30	10.56	9.899	9.295	8.745	8.244	7.786	7.367	6.982	6.628	6.302	6.002	5.724
15	13.87	12.85	11.94	11.12	10.38	9.712	9.108	8.559	8.061	7.606	7.191	6.811	6.462	6.142	5.847
16	14.72	13.58	12.56	11.65	10.84	10.11	9.447	8.851	8.313	7.824	7.379	6.974	6.604	6.265	5.954
17	15.56	14.29	13.17	12.17	11.27	10.48	9.763	9.122	8.544	8.022	7.549	7.120	6.729	6.373	6.047
18	16.40	14.99	13.75	12.66	11.69	10.83	10.06	9.372	8.756	8.201	7.702	7.250	6.840	6.467	6.128
19	17.23	15.68	14.32	13.13	12.09	11.16	10.34	9.604	8.950	8.365	7.839	7.366	6.938	6.550	6.198
20	18.05	16.35	14.88	13.59	12.46	11.47	10.59	9.818	9.129	8.514	7.963	7.469	7.025	6.623	6.259

Number of Years	Interest Rate per Year														
	16%	17%	18%	19%	20%	21%	22%	23%	24%	25%	26%	27%	28%	29%	30%
1	.862	.855	.847	.840	.833	.826	.820	.813	.806	.800	.794	.787	.781	.775	.769
2	1.605	1.585	1.566	1.547	1.528	1.509	1.492	1.474	1.457	1.440	1.424	1.407	1.392	1.376	1.361
3	2.246	2.210	2.174	2.140	2.106	2.074	2.042	2.011	1.981	1.952	1.923	1.896	1.868	1.842	1.816
4	2.798	2.743	2.690	2.639	2.589	2.540	2.494	2.448	2.404	2.362	2.320	2.280	2.241	2.203	2.166
5	3.274	3.199	3.127	3.058	2.991	2.926	2.864	2.803	2.745	2.689	2.635	2.583	2.532	2.483	2.436
6	3.685	3.589	3.498	3.410	3.326	3.245	3.167	3.092	3.020	2.951	2.885	2.821	2.759	2.700	2.643
7	4.039	3.922	3.812	3.706	3.605	3.508	3.416	3.327	3.242	3.161	3.083	3.009	2.937	2.868	2.802
8	4.344	4.207	4.078	3.954	3.837	3.726	3.619	3.518	3.421	3.329	3.241	3.156	3.076	2.999	2.925
9	4.607	4.451	4.303	4.163	4.031	3.905	3.786	3.673	3.566	3.463	3.366	3.273	3.184	3.100	3.019
10	4.833	4.659	4.494	4.339	4.192	4.054	3.923	3.799	3.682	3.571	3.465	3.364	3.269	3.178	3.092
11	5.029	4.836	4.656	4.486	4.327	4.177	4.035	3.902	3.776	3.656	3.543	3.437	3.335	3.239	3.147
12	5.197	4.988	4.793	4.611	4.439	4.278	4.127	3.985	3.851	3.725	3.606	3.493	3.387	3.286	3.190
13	5.342	5.118	4.910	4.715	4.533	4.362	4.203	4.053	3.912	3.780	3.656	3.538	3.427	3.322	3.223
14	5.468	5.229	5.008	4.802	4.611	4.432	4.265	4.108	3.962	3.824	3.695	3.573	3.459	3.351	3.249
15	5.575	5.324	5.092	4.876	4.675	4.489	4.315	4.153	4.001	3.859	3.726	3.601	3.483	3.373	3.268
16	5.668	5.405	5.162	4.938	4.730	4.536	4.357	4.189	4.033	3.887	3.751	3.623	3.503	3.390	3.283
17	5.749	5.475	5.222	4.990	4.775	4.576	4.391	4.219	4.059	3.910	3.771	3.640	3.518	3.403	3.295
18	5.818	5.534	5.273	5.033	4.812	4.608	4.419	4.243	4.080	3.928	3.786	3.654	3.529	3.413	3.304
19	5.877	5.584	5.316	5.070	4.843	4.635	4.442	4.263	4.097	3.942	3.799	3.664	3.539	3.421	3.311
20	5.929	5.628	5.353	5.101	4.870	4.657	4.460	4.279	4.110	3.954	3.808	3.673	3.546	3.427	3.316

Note: For example, if the interest rate is 10% per year, the investment of \$1 received in each of the next 5 years is \$3.791.

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可以使用一般簡易功能的計算機

(1) 環保公司 9 月份現金相關資料如下所示：

銀行對帳單上之資料：

銀行對帳單餘額(9/30)	\$ 34,500
存款不足退票	50
9 月份之手續費	5
銀行代收應收票據 \$ 5,000 及利息 \$ 200	5,200
上月份對另一票據利息入帳錯誤，本月份	
銀行已補貸記本公司之帳戶	100

公司帳上資料：

銀行存款餘額 (9/30) (含庫存現金)	30,700
庫存現金	400
未兌現支票	2,665
在途存款	3,700

試作：(a) 設除帳上有現金短溢之外，無其他錯誤，上項金額皆無誤，試編公司 9 月份銀行往來調節表。

(b) 作 9 月 30 日必要之調整或改正分錄。(20%)

(2) The December 31, 2009 balance sheet of Green Company had Accounts Receivable of \$500,000 and a credit balance in Allowance for Doubtful Accounts of \$33,000. During 2010, the following transactions occurred: sales on account \$1,400,000; sales returns and allowances, \$50,000; collections from customers, \$1,150,000; accounts written off \$35,000; previously written off accounts of \$5,000 were collected.

Instructions

- (a) If the company uses the percentage of sales basis to estimate bad debts expense and anticipates 2% of net sales to be uncollectible, what is the adjusting entry at December 31, 2010?
- (b) If the company uses the percentage of receivables basis to estimate bad debts expense and determines that uncollectible accounts are expected to be 4% of accounts receivable, what is the adjusting entry at December 31, 2010?
- (c) Which basis would produce a higher net income for 2010 and by how much? (20%)

(3) On January 1, 2010, Rock Corporation had \$2,000,000 of \$10 par value common stock outstanding that was issued at par and retained earnings of \$1,000,000. The company issued 200,000 shares of common stock at \$12 per share on July 1. On December 15, the board of directors declared a 15% stock dividend to stockholders of record on December 31, 2010, payable on January 15, 2011. The market value of Rock Corporation stock was \$15

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per share on December 15 and \$16 per share on December 31. Net income for 2010 was \$500,000.

Instructions

- (a) Journalize the issuance of stock on July 1 and the declaration of the stock dividend on December 15.
 (b) Prepare the stockholders' equity section of the balance sheet for Rock Corporation at December 31, 2010. (20%)

(4) The comparative balance sheet of Lucky Company, for 2010 and the preceding year ended December 31, 2009, appears below in condensed form:

	<u>Year</u> 2010	<u>Year</u> 2009
Cash	\$72,000	42,500
Accounts receivable (net)	61,000	70,200
Inventories	121,000	105,000
Investments	100,000
Equipment	515,000	425,000
Accumulated depreciation-equipment	(153,000)	(175,000)
	<u>\$616,000</u>	<u>\$567,700</u>
Accounts payable	\$59,750	\$47,250
Bonds payable, due 2010	75,000
Common stock, \$20 par	375,000	325,000
Premium on common stock	50,000	25,000
Retained earnings	<u>131,250</u>	<u>95,450</u>
	<u>\$616,000</u>	<u>\$567,700</u>

Additional data for the current year are as follows:

- (a) Net income, \$75,800.
 (b) Depreciation reported on income statement, \$38,000.
 (c) Fully depreciated equipment costing \$60,000 was scrapped, no salvage, and equipment was purchased for \$150,000.
 (d) Bonds payable for \$75,000 were retired by payment at their face amount.
 (e) 2,500 shares of common stock were issued at \$30 for cash.

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- (f) Cash dividends declared and paid, \$40,000.
- (g) Investments of \$100,000 were sold for \$125,000.

Prepare a statement of cash flows using the indirect method. (22%)

- (5) 士林公司 01 年 6 月 30 日發行公司債 \$6,000,000，十年後到期，票面利率為 7.6%，每年 6 月 30 日及 12 月 31 日各付息一次，當日以 97.25 之價格全數售出。士林公司採利息法攤銷公司債折價，10 年 12 月 31 日公司債的帳面價值為 \$5,988,461。(18%)

試作：

- (1) 01 年 6 月 30 日發行公司債的分錄。
- (2) 01 年 12 月 31 日付息日之分錄。
- (3) 11 年 6 月 30 日付息及償還公司債的分錄。



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Multiple Choice (1.7 points each) 選擇題請在答案卡上作答，否則不予計分。
Identify the letter of the choice that best completes the statement or answers the question.
Mark each answer clearly with a No. 2 pencil on the Scantron form.

1. When a firm is operating at efficient scale, average total cost will
 - (a) fall as output is increased.
 - (b) fall as output is decreased.
 - (c) be at its maximum.
 - (d) none of the above.

2. If marginal cost exceeds marginal revenue, then
 - (a) the firm must be experiencing losses.
 - (b) the firm may still be earning a profit.
 - (c) the firm is most likely to be at a profit maximizing level of output.
 - (d) a profit maximizing firm should increase the level of production.

3. When a competitive market that is comprised of firms that have identical cost structures experiences a sudden yet persistent increase in demand, which of the following are most likely to happen?
 - (i) New firms will enter the market.
 - (ii) In the long-run all firms will be producing at their efficient scale.
 - (iii) The price will return to the level before the changes in demand in the long-run.
 - (a) (i) and (ii) only
 - (b) (i) and (iii) only
 - (c) (ii) and (iii) only
 - (d) (i), (ii) and (iii)

4. Excessive monopoly profits themselves represent
 - (a) a deadweight loss.
 - (b) a shrinkage in total surplus.
 - (c) a shrinkage in consumer surplus.
 - (d) all of the above.

5. Since natural monopolies have a declining average cost curve, regulating a natural monopoly by setting price equal to marginal cost would

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- (a) cause the monopolist to operate at a loss.
 (b) maximize producer surplus.
 (c) result in a less than optimal total surplus.
 (d) achieve the optimal output level as in the competitive market in the long-run.
6. Consider the Chamberlin's monopolistic competition model. In the short-run equilibrium, the price of a firm must
- (a) equal to the marginal cost
 (b) equal to the marginal cost times the markup and be smaller than the average cost.
 (c) equal to the marginal cost times the markup and be greater or equal to the average cost.
 (d) be smaller than the marginal cost.
7. Suppose there are only two firms supplying in the market and they produce a homogeneous good. Two firms produce the good with the same constant marginal cost. There is no other cost of production. Firms compete by setting price simultaneously. Consumers maximize their utilities. The equilibrium price of both firms must
- (a) equal to the marginal cost times the markup.
 (b) equal to the marginal cost
 (c) be greater than the marginal cost but smaller than the marginal cost times the markup.
 (d) equal to the average cost.
8. Everything is the same as previous question, but one firm (firm A) has higher marginal cost than the other (firm B.) The equilibrium price must
- (a) equal to the marginal cost of firm A
 (b) equal to the marginal cost of firm B
 (c) be slightly below the marginal cost of firm A or equal to the optimal price of firm B as it has the monopoly power.
 (d) equal to the average cost of firm A.
9. Suppose in a country, there is a sector where producers produce a homogeneous good with an increasing constant marginal cost. There is a negative externality when producing the good. Suppose the country is a small open economy, which means it can import the good with a constant price. Suppose also that it does not have comparative advantage in producing the good and there is no complete specialization under free trade. In the following choices, what is the best policy to resolve the problem of externality?
- (a) Using an import subsidy.
 (b) Using a production subsidy.
 (c) Using a tariff.
 (d) Using a production tax.

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10. In a Ricardian trade model with two countries and two goods, suppose one country has absolute advantage in producing both goods. Goods are traded freely. The country with lower productivity must produce at least one good because
- both countries enjoy gains from trade.
 - otherwise, the factor market cannot be clear.
 - two countries complete specialize in a sector at equilibrium.
 - both goods are demanded.
11. A simple linear demand function may be stated as $Q = a - bP + cI$ where Q is quantity demanded, P is the product price, and I is consumer income. To compute an appropriate value for c , we can use observed values for Q and I and then set the estimated income elasticity of demand equal to:
- $c(I/Q)$
 - $c(Q/I)$
 - $-b(I/Q)$
 - $Q/(cI)$
12. Use the following two statements to answer this question:
- If utility is ordinal, a market basket that provides 30 utils provides twice the satisfaction of a market basket that provides 15 utils.
 - When economists first studied utility it was believed that utility was cardinal, but it was later discovered that ordinal preferences are sufficient to explain how most individual decisions are made.
- Both I and II are true.
 - I is true, and II is false.
 - I is false, and II is true.
 - Both I and II are false.
13. Which of the following demand functions represents a price elasticity of demand equal to -0.33 and an income elasticity of demand equal to 0.8 at all points along the curve?
- $Q = 3 - 0.33P + 0.8I$
 - $Q = 4.5 - 0.33\log(P) + 0.8I$
 - $\log(Q) = 1.34 - 0.33\log(P) + 0.8I$
 - $\log(Q) = 2.34 - 0.33 \log(P) + 0.8 \log(I)$
14. Bob views apples and oranges as perfect substitutes in his consumption, and $MRS = 1$ for all combinations of the two goods in his indifference map. Suppose the price of apples is \$2 per pound, the price of oranges is \$3 per pound, and Bob's budget is \$30 per week. What is Bob's utility maximizing choice between these two

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goods?

- (a) 4 pounds of apples and 6 pounds of oranges
- (b) 5 pounds of apples and 5 pounds of oranges
- (c) 10 pounds of oranges and no apples
- (d) 15 pounds of apples and no oranges

15. Assume that we have a demand curve of the form:

$$\log(Q) = a - b \log(P) + c \log(I),$$

where Q = quantity, P = price, I = income, and a , b , and c are positive constants. The income and price elasticities for the demand curve represented above are always

- (a) equal to one.
- (b) equal to zero.
- (c) equal (i.e., income elasticity always equals price elasticity).
- (d) constant but not necessarily equal to one another.

16. Let P denote the price of goods in the Taiwan, P^W denote the price of goods in the foreign country, and E the exchange rate, measured as the number of units of foreign currency that can be purchased with one NTD.

According to the law of one price,

- (a) $P = EP^W$.
- (b) $P^W = EP$.
- (c) $E = P/P^W$.
- (d) $P^W = E + P$.

17. Purchasing-power parity describes the forces that determine

- (a) prices in the short run.
- (b) prices in the long run.
- (c) exchange rates in the short run.
- (d) exchange rates in the long run.

18. If a McDonald's Big Mac cost \$3.06 in the United States and 3.21 euros in the Euro area, then purchasing-power parity implies the nominal exchange rate is how many euros per dollar (approximately)?

- (a) 1.05. If the value is less than this, it costs more dollars to buy a Big Mac in the U.S. than in the Euro area.
- (b) 1.05. If the value is less than this, it costs fewer dollars to buy a Big Mac in the U.S. than in the Euro area.
- (c) .95. If the value is less than this, it costs more dollars to buy a Big Mac in the U.S. than in the Euro area.
- (d) .95. If the value is less than this, it costs fewer dollars to buy a Big Mac in the U.S. than in the Euro area.

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19. Which of the following does the level of real GDP measure?
- (a) total real income
 - (b) productivity
 - (c) the standard of living
 - (d) All of the above are correct.
20. "When workers have a relatively small quantity of capital to use in producing goods and services, giving them an additional unit of capital increases their productivity by a relatively large amount." This statement
- (a) is an assertion that production functions have the property of constant returns to scale.
 - (b) is consistent with the view that capital is subject to diminishing returns.
 - (c) is inconsistent with the view that it is easier for a country to grow fast if it starts out relatively poor.
 - (d) All of the above are correct.
21. If an unemployed person quits looking for work, then, other things the same, the unemployment rate
- (a) decreases and the labor-force participation rate is unaffected.
 - (b) and the labor-force participation rate both decrease.
 - (c) is unaffected and the labor-force participation rate decreases.
 - (d) and the labor-force participation rate are both unaffected.
22. Suppose that efficiency wages become more common in the economy. Economists would predict that this would
- (a) increase the quantity demanded and decrease the quantity supplied of labor, thereby decreasing the natural rate of unemployment.
 - (b) decrease the quantity demanded and increase the quantity supplied of labor, thereby increasing the natural rate of unemployment.
 - (c) increase the quantity demanded and decrease the quantity supplied of labor, thereby increasing the natural rate of unemployment.
 - (d) decrease the quantity demanded and increase the quantity supplied of labor, thereby decreasing the natural rate of unemployment.
23. An increase in the money supply
- (a) and an investment tax credit both cause aggregate demand to shift right.
 - (b) and an investment tax credit both cause aggregate demand to shift left.
 - (c) causes aggregate demand to shift right, while an investment tax credit causes aggregate demand to shift left.

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(d) causes aggregate demand to shift left, while an investment tax credit causes aggregate demand to shift right.

24. Sticky nominal wages can result in

- (a) lower profits for firms when the price level is lower than expected.
- (b) a decrease in real wages when the price level is lower than expected.
- (c) a short-run aggregate-supply curve that is vertical.
- (d) a long-run aggregate-supply curve that is upward-sloping.

25. Which of the following would cause prices and real GDP to rise in the short run?

- (a) an increase in the expected price level
- (b) an increase in the money supply
- (c) a decrease in the capital stock
- (d) None of the above is correct.

26. Which of the following monetary policy violates Taylor principle?

- (a) The central bank raises the federal funds rate from 1% to 2% when inflation goes from 2% to 2.5%.
- (b) The central bank raises the federal funds rate from 1% to 2% when output gap goes from 2% to 3%.
- (c) The central bank raises the federal funds rate from 1% to 2% when inflation goes from 2% to 3%.
- (d) The central bank raises the federal funds rate from 1% to 2% when output gap goes from 2% to 2.5%.

27. The M1 money multiplier will shrink due to

- (a) smaller excess reserves ratio.
- (b) smaller currency ratio.
- (c) greater time deposits ratio.
- (d) greater required reserves ratio.

28. A higher growth rate of money supply causes

- (a) lower interest rates if liquidity effect is larger than income and expected inflation effects.
- (b) higher interest rates if liquidity effect is larger than income and expected inflation effects.
- (c) lower interest rates if liquidity effect is smaller than income and expected inflation effects and the adjustment of expected inflation is slow.
- (d) lower interest rates if liquidity effect is smaller than income and expected inflation effects and the adjustment of expected inflation is fast.

29. Nowadays, most countries do not adopt monetary targeting since

- (a) the public do not understand how monetary targeting works.
- (b) the velocity of money is unstable and quite volatile.

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- (c) the relationship of output and money aggregates is weak.
- (d) inflation and money aggregates have inverse relationship.

30. Which of the following statements is true?

- (a) The conventional Phillips curve has microeconomic foundation.
- (b) The New Keynesian Phillips curve is merely a statistical relation.
- (c) The New Keynesian Phillips curve describes how current inflation depends on future expected inflation and unemployment.
- (d) The New Keynesian Phillips curve describes how current inflation depends on future expected inflation and real marginal cost.

Numerical/algebraic problems and short-essay questions

Please answer the following questions IN SEQUENCE. All questions may be answered in EITHER Chinese OR English.

1. A video game producer has costs of \$25,000 per month that are fixed with regard to output. The firm has a flat marginal cost at \$5 per unit of output for output between 1 and 16,000 units. The firm **cannot** produce more than 16,000 units. Information from the market research group indicates that the demand for the video game can be represented by the following $P = 9.8 - 0.0002Q$.

(a) (3 points) What price should be set to maximize profit? How many units of the game are sold? What are the profits of the firm?

The firm has the opportunity to sell in a second market that is separated from the first. For the second market the market research group has estimated the demand relationship to be $P_2 = 7 - 0.0001Q_2$.

(b) (5 points) The firm believes that this second market offers an opportunity for additional profit. Should it sell only units that would not be absorbed in the primary market at the profit-maximizing price or should it divert some units from the primary to the secondary market? What price would you set in each market? What is the profit of the firm?

2. Suppose there is a country producing two goods with the following technology

$$Q_x = L_x$$

$$Q_y = K_y$$

Suppose that the labor supply is fixed at 50 units and the capital supply is fixed at 100 units. Consumers spend

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half of their income on good X and the rest of income on good Y. All markets are perfectly competitive. Let good Y be the numeraire. Answer the following questions

- (a) (3 points) Derive the equilibrium price of X relative to Y.
- (b) (3 points) Suppose there is another country producing two goods with the same technology and consumers in that country also evenly spend their income on both goods. In this country, the supply of labor is fixed at 100 units and the supply of capital is fixed at 50 units. Derive the equilibrium price of X relative to Y if two countries trade freely.
- (c) (3 points) What is the good the capital abundant country exports? How many quantities of that good does it export?
3. Chester lives in a dormitory that offers soft drinks and chips for sale in vending machines. His utility function is $U = 3SC$ (where S is the number of soft drinks per week and C the number of bags of chips per week), so his marginal utility of S is $3C$ and his marginal utility of C is $3S$. Soft drinks are priced at \$0.50 each, chips \$0.25 per bag.
- (a) (3 points) Write an expression for Chester's marginal rate of substitution between soft drinks and chips.
- (b) (3 points) Use the expression generated in part (a) to determine Chester's optimal mix of soft drinks and chips.
- (c) (2 points) If Chester has \$5.00 per week to spend on chips and soft drinks, how many of each should he purchase per week?
4. To catch up with the living standard of the US,
- (a) (4 points) Can a sufficiently poorer country achieve this goal by simply receiving more capital donated by the United Nation on a per-capita basis? Why or why not?
- (b) (4 points) Can a sufficiently poorer country achieve this goal by simply increase her saving rate? Why or why not?
5. Use the model of aggregate demand and aggregate supply to illustrate each of the following event's short-run and long-run impacts on the aggregate price level and aggregate output.
- (a) (4 points) There is an increase in households' wealth due a stock market boom.
- (b) (4 points) The government lowers taxes, leaving households with more disposable income, with no corresponding reduction in government spending.
6. Consider a model that the central bank may have incentives to deviate from a monetary policy rule. The central bank's objective is to maximize the expected value of

$$U = \lambda(y - y_n) - \frac{1}{2}\pi^2,$$

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where y is output, y_n is the economy's natural rate of output, π is inflation rate, and $\lambda > 0$. The aggregate output is given by a Lucas-type supply function:

$$y = y_n + a(\pi - \pi^e) + e,$$

where π^e is expected inflation, e is a supply shock ($e \sim N(0, \sigma_e^2)$), and $a > 0$. The link between inflation and the monetary policy instrument is given by

$$\pi = \Delta m + v,$$

where Δm is the growth rate of money and v is a velocity disturbance ($v \sim N(0, \sigma_v^2)$). We assume that the central bank can observe π^e and the realization of e but not the realization of v before its choice of Δm . We also assume that two disturbances e and v are uncorrelated.

- (a) (4 points) What is the central bank's optimal choice of Δm ?
- (b) (4 points) Compared to the case that the central bank commits to a rule $\Delta m = 0$, which policy makes the society better off (i.e. higher expected utility)? Show all your work.

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I. Multiple choice questions 選擇題請在答案卡上作答，否則不予計分。

Some upper quantiles for $N(0,1)$: $z_{0.01} = 2.33$, $z_{0.025} = 1.96$, $z_{0.05} = 1.65$, $z_{0.1} = 1.28$

Questions 1-20: 2 points each (Identify all correct choices, possibly more than one.)

Questions 21-30: 3 points each (Each question has exactly one choice.)

1. One principle of a justice system is that the defendant in a trial should be considered innocent until proven guilty.
 - (a) The null hypothesis would be H_0 : The defendant is innocent.
 - (b) The null hypothesis would be H_0 : The defendant is guilty.
 - (c) The burden of proof lies with the defendant.
 - (d) The burden of proof lies with the prosecutor.
2. (Cont'd)
 - (a) A Type I error would occur if a guilty person is set free.
 - (b) A Type II error would occur if a guilty person is set free.
 - (c) "Setting a guilty person free" is considered a less serious mistake than "falsely convicting an innocent person."
 - (d) Once you have made a decision, the chance of committing a Type I error is 0 or 1.
3. Which ones of the following statements are correct?
 - (a) The probability of committing a Type I error is called the *level of significance*.
 - (b) Type I error is the error of rejecting H_0 when it is true.
 - (c) Type II error is the error of rejecting H_0 when it is true.
 - (d) We would reject the null hypothesis if the significance level is less than the critical value.
4. Which ones of the following statements are correct?
 - (a) A small p -value indicates that the observed data are unlikely if the null hypothesis is true.
 - (b) The p -value is the probability of obtaining an observed data that is as extreme as, or more extreme than, the current observed data, under the alternative hypothesis.
 - (c) We would reject the null hypothesis if the critical value is smaller than the p -value.
 - (d) A smaller p -value shows stronger evidence by the data against the null hypothesis.
5. Suppose that $X \sim \text{Binomial}(4, \theta)$. We want to test $H_0: \theta = 0.5$ v.s. $H_1: \theta > 0.5$. Suppose that we observe $X = 3$. The p -value is
 - (a) 0.0625
 - (b) 0.25
 - (c) 0.3125
 - (d) None of the above
6. Suppose that $X \sim \text{Binomial}(4, \theta)$. We want to test $H_0: \theta = 0.5$ v.s. $H_1: \theta \neq 0.5$. Suppose that we observe $X = 3$. The p -value is
 - (a) 0.0625
 - (b) 0.25

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- (c) 0.3125
(d) None of the above
7. Suppose that the significance level for a statistical test is specified at 0.05 and the obtained p -value is 0.1.
- (a) The result is *statistically significant*.
(b) The result is *not statistically significant*.
(c) A statistically significant result may not be practically significant.
(d) We would not reject the null hypothesis.
8. Which ones of the following statements are correct?
- (a) A *sample* is the whole population.
(b) A *parameter* is a numerical value that would be calculated based on the whole population.
(c) A *statistic* is a numerical value that is calculated based on the sample.
(d) Non of the above.
9. Suppose that $P(A) = .80$, $P(B|A) = .05$, and $P(B|A^c) = .30$. Then, the probabilities $P(B) =$ and $P(A|B) =$ are
- (a) 0.2 and 0.4, respectively.
(b) 0.1 and 0.4, respectively.
(c) 0.05 and 0.2, respectively.
(d) None of the above
10. (Cont'd)
- (a) The events A and B are independent.
(b) The events A^c and B are independent.
(c) Let A_1 and A_2 be two events. If A_1 and A_2 are independent, then A_1^c and A_2 are independent.
(d) If A_1 and A_2 are mutually exclusive, then A_1 and A_2 are independent.
(e) None of the above.
11. In a room of 20 people, what is the probability that at least two people were born on the same day? (Let C_x^n denote the combinations of choosing x items from n items.)
- (a) $\frac{(20!)C_{20}^{365}}{(365)^{20}}$
(b) $1 - \frac{(20!)C_{20}^{365}}{(365)^{20}}$
(c) $\frac{C_{20}^{365}}{(365)^{20}}$
(d) $1 - \frac{C_{20}^{365}}{(365)^{20}}$
(e) None of the above.
12. Suppose that $X \sim \text{Binomial}(n, \pi)$ and that both $n\pi$ and $n(1 - \pi)$ are at least 5. The central limit theorem says that the distribution of $\frac{X}{n}$ is approximately normal with mean and variances
- (a) π and $\pi(1 - \pi)$, respectively.

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- (b) $\frac{\pi}{n}$ and $\frac{\pi(1-\pi)}{n}$, respectively.
- (c) π and $\frac{\pi(1-\pi)}{n}$, respectively.
- (d) $\frac{\pi}{n}$ and $\pi(1-\pi)$, respectively.
- (e) None of the above
13. A study was conducted to estimate p , the proportion of college students who are vegetarians. Based on the results of a random sample of size 225, the 95% confidence interval for p was found to be (0.20,0.32). Which ones of the following statements are true ?
- (a) About 95% of college students have between a 20% and a 32% chance of being vegetarians.
- (b) There is a 95% probability that the population proportion lies between 0.20 and 0.32.
- (c) The "95% confidence" means that – in repeated experiments, about 95% of the times the interval (0.20,0.32) will cover the sample proportion.
- (d) If the sample size increases to 400, we expect the 95% confidence interval to be wider than the interval (0.20,0.32).
- (e) None of the above.
14. A random sample of voters from Taiwan is to be selected and asked which ones of the three president candidates he or she may support. If the margin of error for the estimated proportion is specified to be 0.03 at 95% confidence, what is the approximately required sample size?
- (a) 750
- (b) 1070
- (c) 2050
- (d) 4268
- (e) None of the above.
15. Suppose that among a random sample of 2000 voters 1100 plan to vote for the incumbent president. Develop a 95% confidence interval for the population proportion that supports the incumbent president
- (a) (0.47,0.63)
- (b) (0.50,0.60)
- (c) (0.51,0.59)
- (d) (0.53,0.57)
- (e) None of the above.
16. Which ones of the following statements are correct?
- (a) An index number is a number that expresses the absolute change in price, quantity, or value compared to a base period.
- (b) Both the Laspeyres index and the Paasche index are weighted indexes.
- (c) The Laspeyres index is $P = \frac{\sum P_1 q_0}{\sum P_0 q_0} \times 100$, which requires quantity data from only the current period.
- (d) The *moving average* is useful in smoothing a time series to see its trend. It is accomplished by moving the arithmetic mean values through the time series.
- (e) None of the above.

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17. The district sales manager for a car manufacturer would like to study what factors affect the number of cars sold at a dealership. To investigate, he randomly selects 12 dealers. From these dealers he obtains the number of cars sold last month, the minutes of radio advertising purchased last month and the number of full-time salespeople employed in the dealership. The resulting regression model is

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \text{error},$$

where Y is *Cars Sold*, X_1 is *Advertising*, and X_2 is *Sales Force*. Which ones of the following are possible sources of the randomness in above linear model?

- (a) size of the dealer
 - (b) total number of dealers in the country
 - (c) average age of full-time salespeople employed in the dealer
 - (d) location of the dealer
 - (e) none of the above
18. Consider the regression model $Y_i = \beta_0 + \beta_1 X_i + e_i$, where e_i are assumed to be i.i.d. $N(0,1)$. Which ones of the following statements about least squares line are correct?
- (a) The sum of residuals are always zero.
 - (b) The least squares regression line always pass through the point (\bar{X}, \bar{Y}) , where \bar{X} is the mean of $\{X_i\}$ and \bar{Y} is the mean of $\{Y_i\}$.
 - (c) There is no other line through the data where the sum of the squared deviations is smaller.
 - (d) The i.i.d assumption is necessary for conducting least squares estimation.
19. Which ones of the following statements are correct?
- (a) Multicollinearity exists when dependent and independent variables are correlated.
 - (b) We can check for multicollinearity by histogram of the residuals.
 - (c) If successive observations of dependent variables are correlated, we say that the data are autocorrelated.
 - (d) We can check for autocorrelation by the residual plot.
20. Which ones of the following statements are correct?
- (a) In regression, a *dummy variable* is a variable in which there are only two possible outcomes. For analysis, we can code one of the outcomes as a 1 and the other a 0.
 - (b) If a qualitative variable used in a regression model has three possible outcomes, we can code it by a dummy variable with values -1,0,1.
 - (c) If a qualitative variable used in a regression model has three possible outcomes, we can code it by a dummy variable with values 0,1,2.
 - (d) None of the above.
21. Suppose that the life expectancy of traditional light bulbs follows $N(400, \sigma^2)$, where σ is the unknown standard deviation. A light bulb company claimed to have developed a new type of bulbs that can last longer. To conduct the test, 50 new bulbs were randomly selected. The average life expectancy is found to be 406 hours and the sample standard deviation is 20 hours. Set $\alpha = 0.05$. The null and alternative hypotheses are

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- (a) $H_0: \mu = 400$ versus $H_1: \mu \neq 400$
 (b) $H_0: \mu = 400$ versus $H_1: \mu > 400$
 (c) $H_0: \mu = 400$ versus $H_1: \mu < 400$
 (d) $H_0: \mu = 406$ versus $H_1: \mu \neq 406$

22. (Cont'd) The z statistic is

- (a) 1.65
 (b) 1.96
 (c) 2.12
 (d) 2.65
 (e) None of the above.

23. (Cont'd) The critical value is

- (a) 1.65
 (b) 1.96
 (c) 2.12
 (d) 2.65
 (e) None of the above.

24. (Cont'd) The p -value is:

- (a) p -value < 0.025
 (b) p -value $= 0.025$
 (c) $0.025 < p$ -value < 0.05
 (d) p -value $= 0.05$
 (e) None of the above.

25. (Cont'd) The probability of committing the Type I error is

- (a) 0.017
 (b) 0.025
 (c) 0.05
 (d) 0.1
 (e) None of the above.

26. (Cont'd) Approximately what sample size would be necessary in order to have a 95% confidence interval for the population mean with a margin of error of 5?

- (a) 44
 (b) 62
 (c) 72
 (d) 246
 (e) None of the above.

27. (Cont'd) What is the type II error β when the true population mean is 420?

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- (a) 0.0
 (b) 0.025
 (c) 0.05
 (d) 0.1
 (e) None of the above.

28. (Cont'd) A 90% confidence interval for the mean life expectancy of the new bulbs is

- (a) (396,416)
 (b) (398,414)
 (c) (401,411)
 (d) (404,408)
 (e) None of the above.

29. A stockbroker reported that the mean rate of return on a sample of 10 oil stocks was 12.6 percent with a standard deviation of 3.9 percent. The mean rate of return on a sample of 8 utility stocks was 10.9 percent with a standard deviation of 3.5 percent. What test statistic can we use to test whether there is more variation in the oil stocks?

- (a) Z
 (b) t
 (c) F
 (d) χ^2

30. (Cont'd) The observed test statistic is

- (a) 3.9/3.5
 (b) $(3.9/3.5)^2$
 (c) 12.6/10.9
 (d) $(\frac{12.6}{3.9})/(\frac{10.9}{3.5})$
 (e) None of the above.

II. Short-answer questions

1. (30%) The market model assumes that the rate of return on a stock is linearly related to the rate of return on the overall market. The model has the form

$$R = \beta_0 + \beta_1 R_m + e$$

where R is the return on a particular stock and R_m is the return on some major stock index, such as the New York Stock Exchange Composite Index.

Now apply the market model to the monthly returns of a telecom company listed on the Tokyo Stock Exchange (TSE). Part of the regression output is below.

Regression Analysis

Predictor	Coef	StDev	T	P VALUE
Constant		0.008223	1.56	0.124
TSE		0.1724	5.15	0.000

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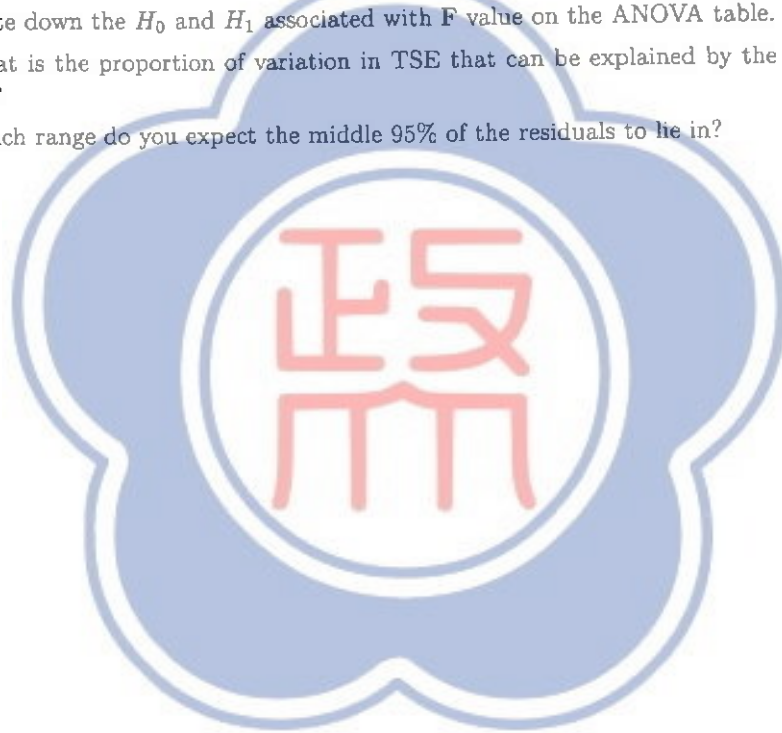
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Analysis of Variance

Source	DF	SS	MS	F VALUE
Model	1	0.10563		
Error	58	0.23110		
C Total	59	0.33673		

- (6%) Determine the regression equation.
- (6%) From the ANOVA table, obtain Mean Square due to the regression model, Mean Square due to error, and the F-value.
- (4%) Write down the H_0 and H_1 associated with T value = 5.15.
- (4%) Write down the H_0 and H_1 associated with F value on the ANOVA table.
- (5%) What is the proportion of variation in TSE that can be explained by the telecom company?
- (5%) Which range do you expect the middle 95% of the residuals to lie in?



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1. (10%) Please find the sum of the series $\sum_{n=0}^{\infty} \frac{2^n}{3^{n!}}$.

2. (10%) Please evaluate the following limit:

$$\lim_{x \rightarrow \infty} \left(1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \cdots - \frac{1}{2x} \right)$$

3. (10%) Please determine whether the integral $\int_0^{\infty} e^{-x^2} dx$ converges or diverges. (You have to give the derivation to justify your answer.)

4. (30%) Please evaluate the following integrals:

(a) (10%) $\int \frac{\sqrt{1-\sqrt{x}}}{\sqrt{x}} dx$

(b) (10%) $\int \frac{x e^{x^2}}{e^{x^2} + 1} dx$

(c) (10%) $\int \frac{x^3 e^{x^2}}{(x^2+1)^2} dx$

5. (10%) Please find the area of region bounded by the graphs of $x = 4 - y^2$ and $x = y - 2$ by integrating with respect to x .

6. (15%) Suppose that $g : R^2 \rightarrow R$. For a double integral $\int_0^t \int_0^u g(s, u) ds du$, after changing the order of this double integral, what would be the new interval for the double integral? You just need to find what the X , Y , and Z are in the second double integral.

$$\int_0^t \int_0^u g(s, u) ds du = \int_0^X \int_Y^Z g(s, u) du ds$$

7. (15%) Given that

$$\sigma(t, T) = \sigma(t, t) e^{-\int_t^T k(x) dx}$$

and define

$$y(t) = \int_0^t \sigma^2(s, t) ds$$

please find what $dy(t)$ is?

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